One SDN to connect them all

February 3rd, 2024, FOSDEM Virt & Cloud Dev Room

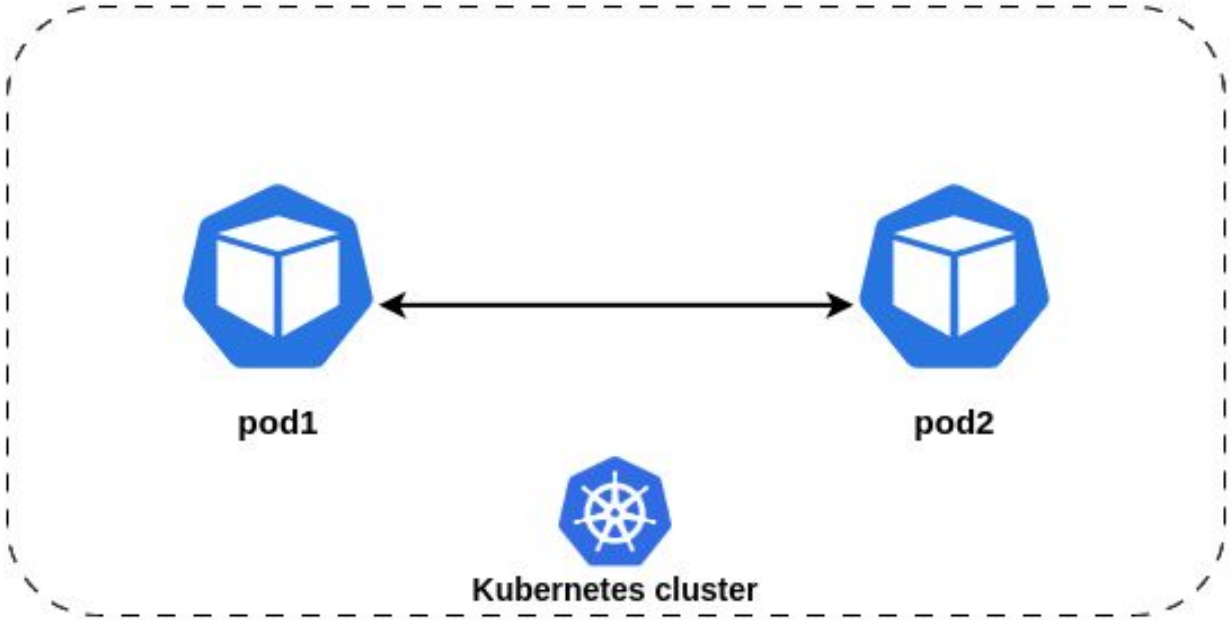
Miguel Duarte
mdbarroso@redhat.com
https://github.com/maiqueb

KubeVirt

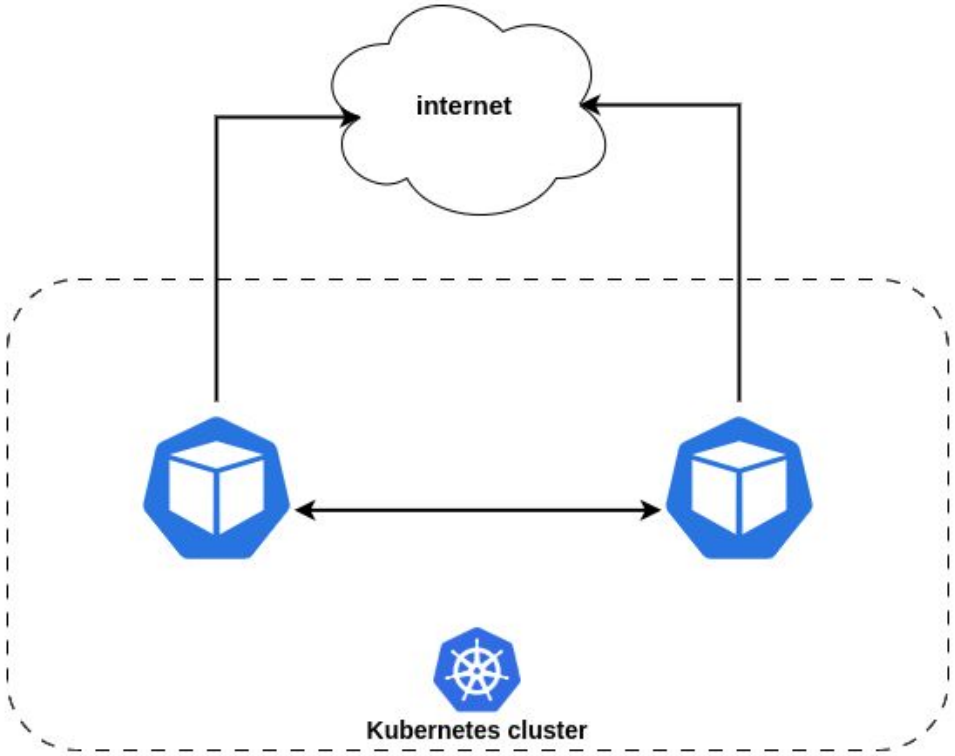
Agenda

- Motivation & problem we’re trying to solve
- Introduction
- Implemented use cases + Demos
- Roadmap
- Lessons learnt

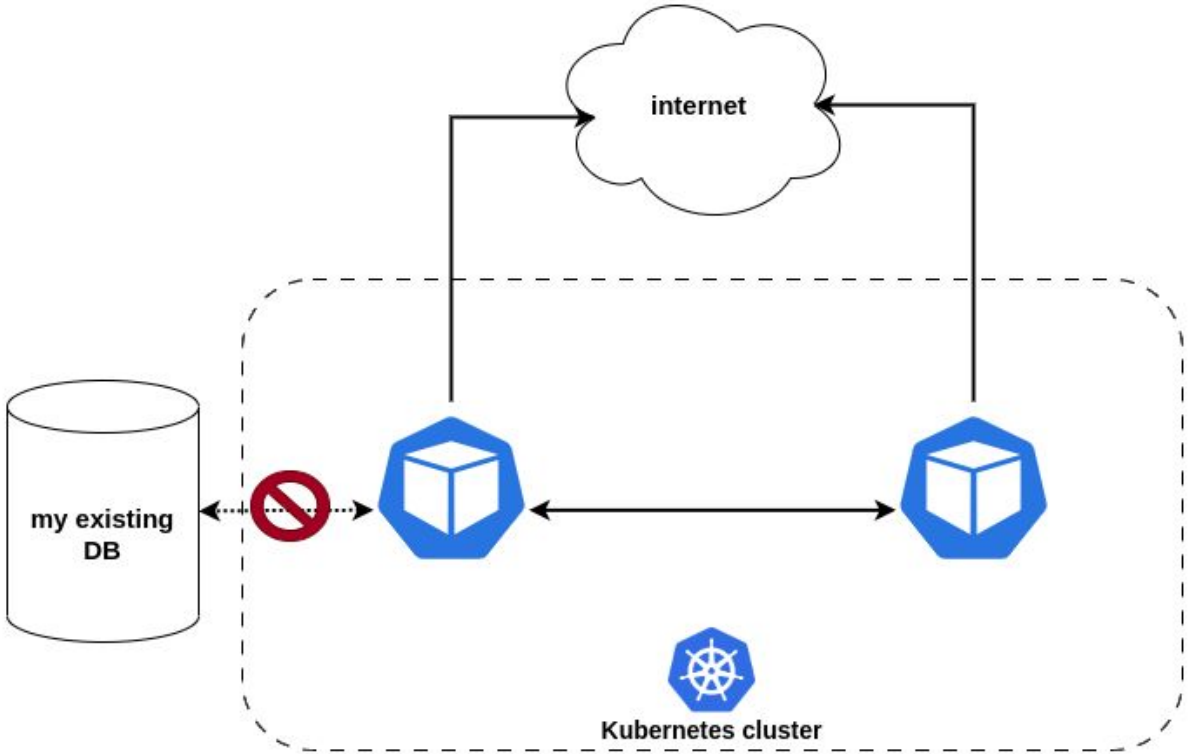
Motivation & Problem



https://kubernetes.io/docs/concepts/services-networking/#the-kubernetes-network-model

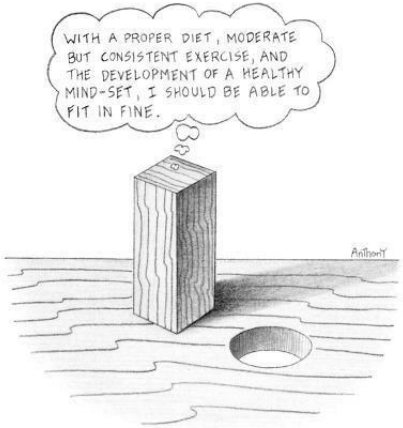


For ingress: use services / ingress types
https://kubernetes.io/docs/concepts/services-networking/#the-kubernetes-network-model


internet
my existing
DB
Kubernetes cluster

Motivation

No batteries to access stuff on the physical network



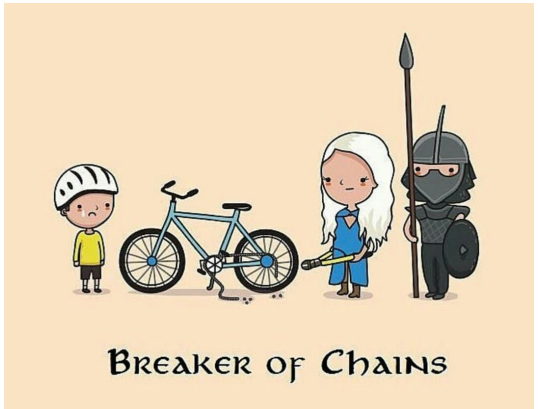
https://www.pinterest.es/pin/213921051038330829

Default cluster network is not suited for all use cases

https://picsart.com/i/image-414453098045201

Mix and match of technologies to implement use cases is expensive

Objectives



https://www.pinterest.com/pin/465207836504568697

Liberate the cluster / network admins

Push complexity to a programmable network

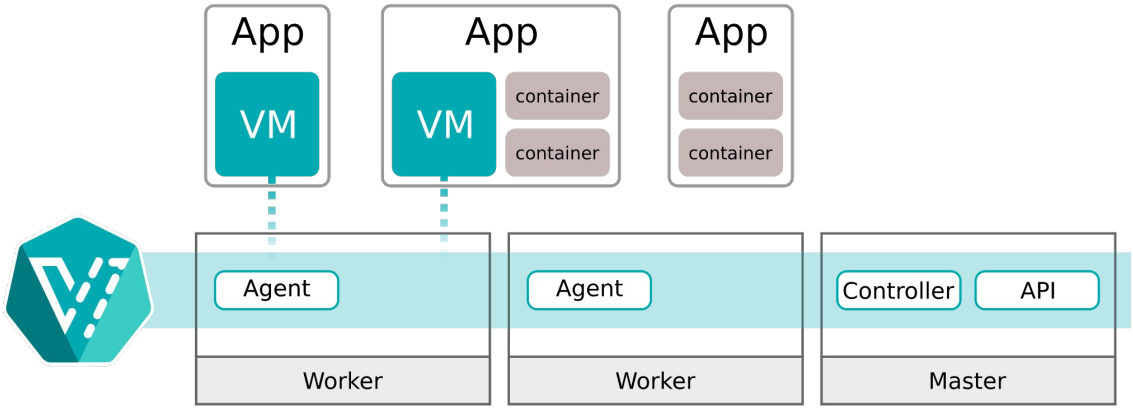
Victorinox/Beecher LaFrance

Multiple use-cases in a single plugin

Intro

KubeVirt

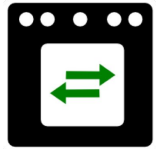
- Kubernetes plugin
  - Try it out
- Runs VMs alongside pods in the same platform (Kubernetes)
- Each pod runs libvirt + qemu process for the VM
- VM networking requirements >> pod networking requirements



OVN / OVN-K

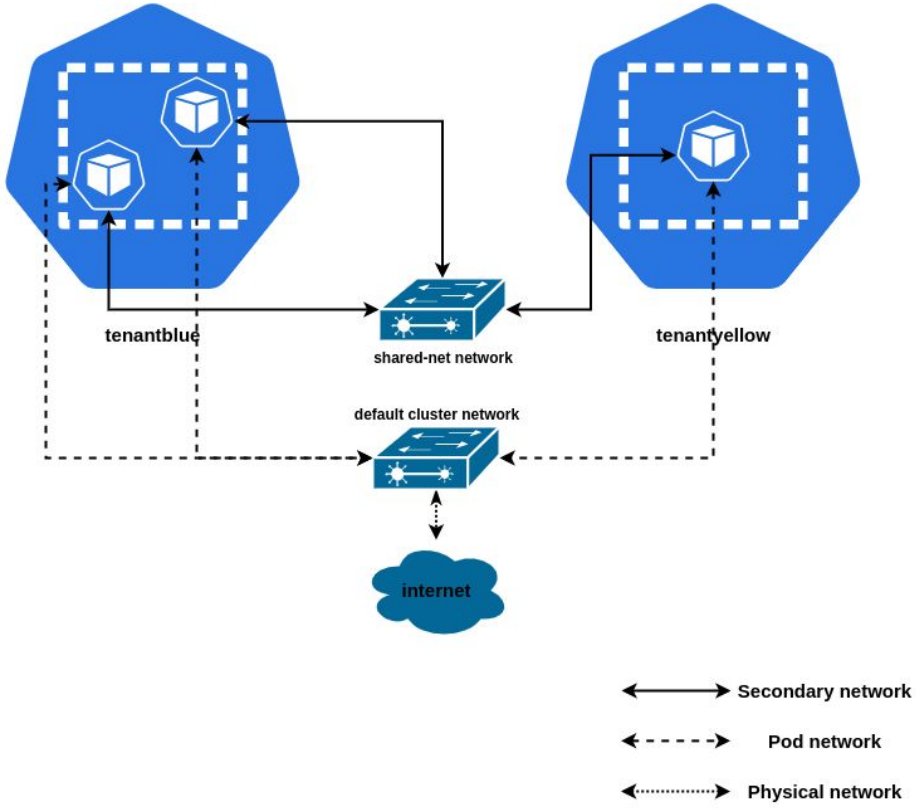
- OVN provides a higher-layer of abstraction than Open vSwitch
  - SDN
  - Open vSwitch orchestrator
  - Logical routers / logical switches, ACLs, etc rendered to openflow

- OVN-Kubernetes => CNI plugin **for** Kubernetes
  - Translates Kubernetes objects to OVN logical entities
    - secondary network => logical switch
    - Pod attachment => logical switch port
    - Network policy => port group + ACLs



Supported use cases

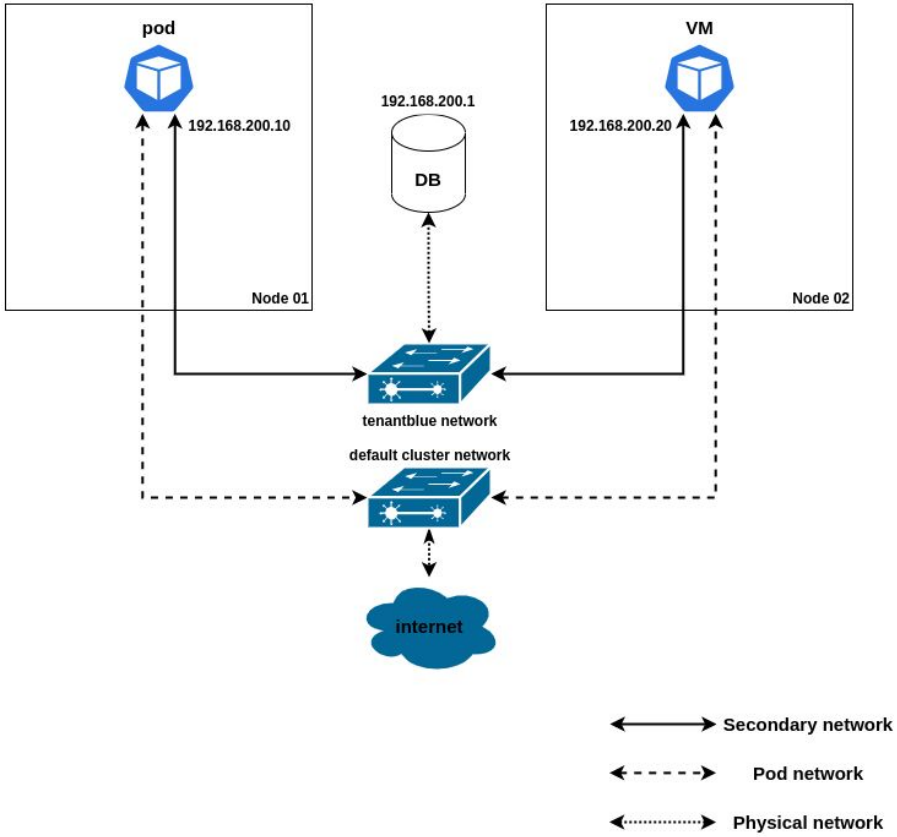
East / west communication



East / west mixed workload communication

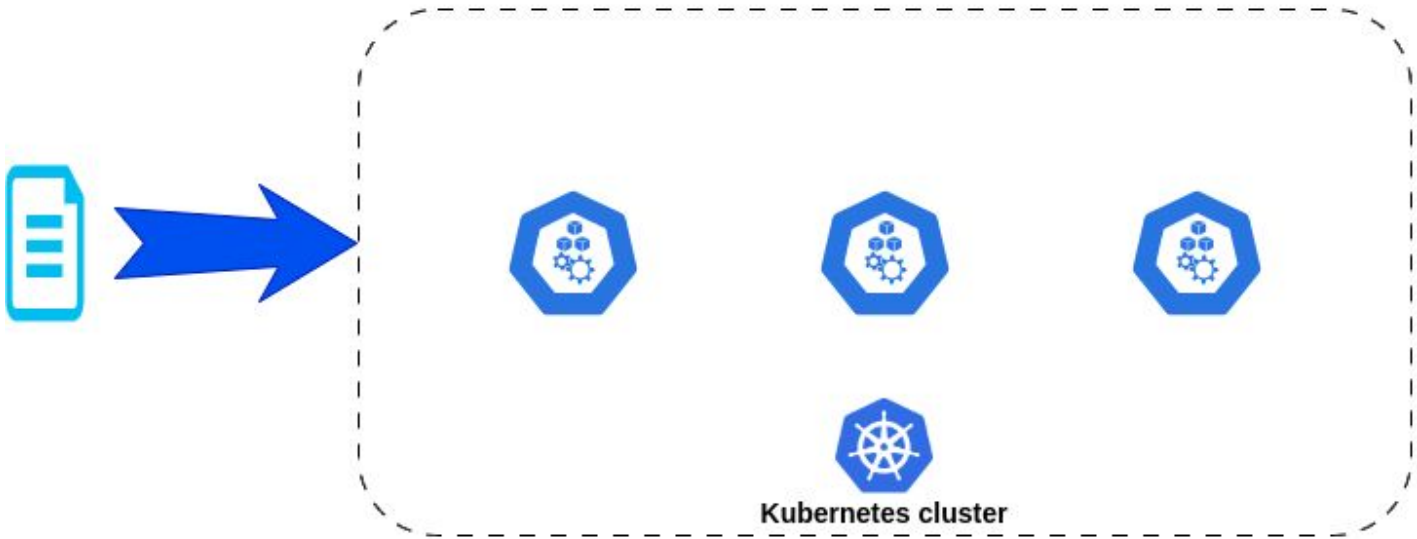
- Network attachment configuration
- Workload definition
- Demo - Overlay mixed workloads

Access to the physical network



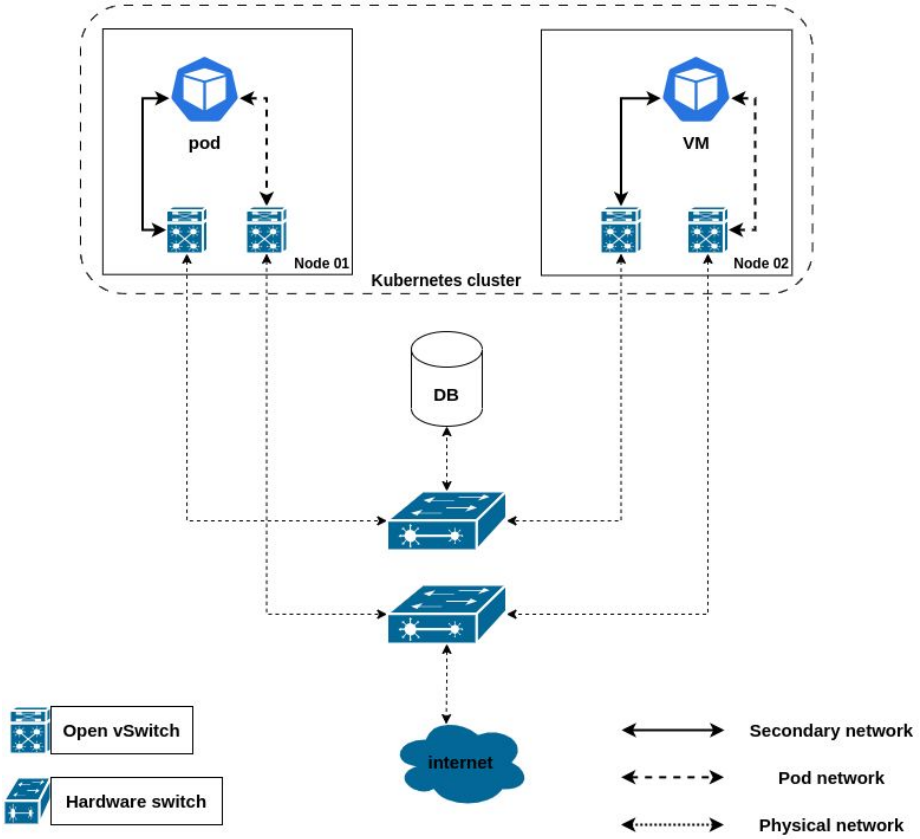
Configuring the underlay / physical network

- NMState & Kubernetes-nmstate
  - Kubernetes native
  - NodeNetworkConfigurationPolicy

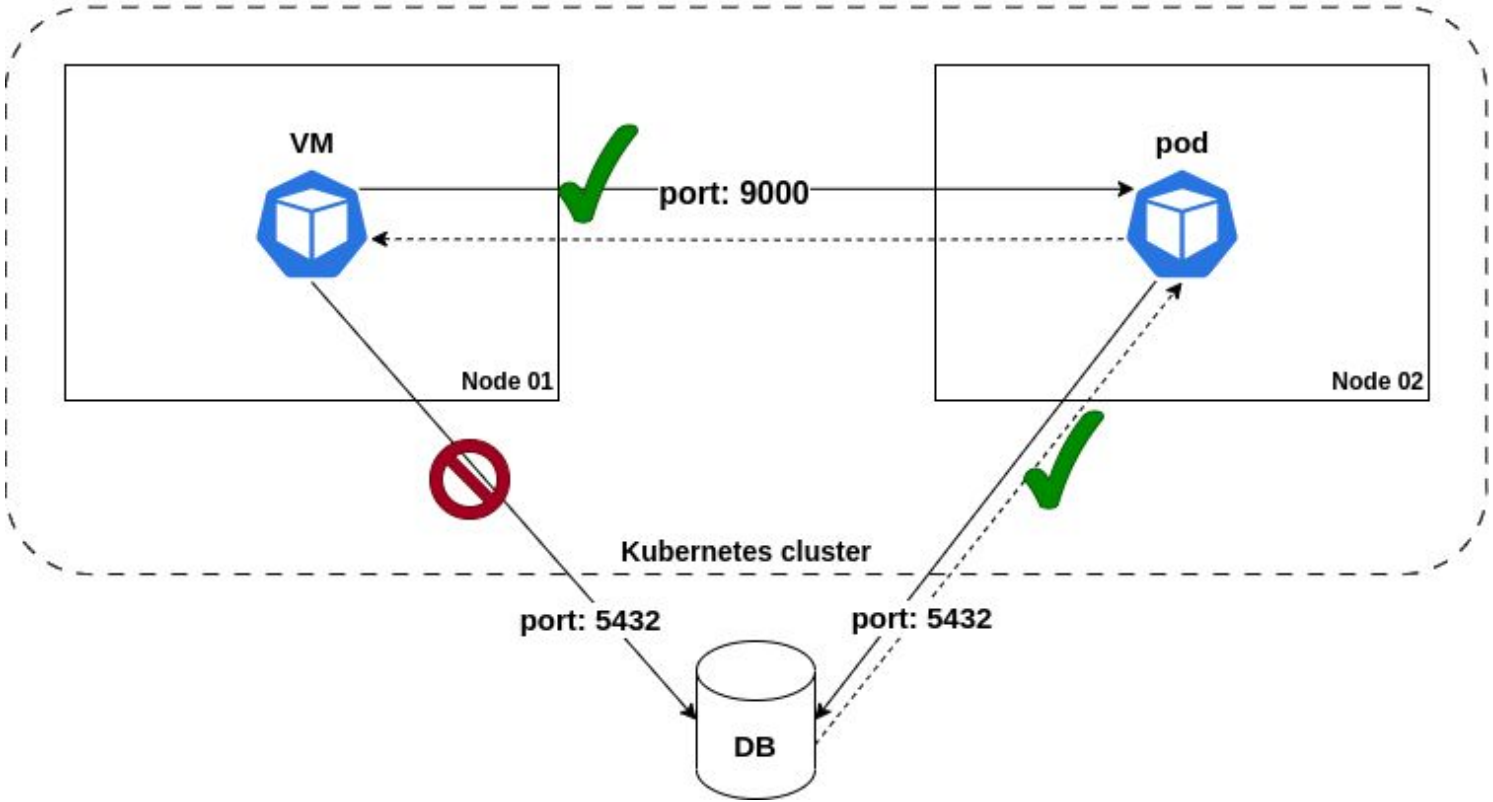


Configuring the underlay / physical network

```
apiVersion: nmstate.io/v1
kind: NodeNetworkConfigurationPolicy
metadata:
  name: ovs-dedicated-bridge
spec:
  nodeSelector:
    node-role.kubernetes.io/worker: ""
  desiredState:
    interfaces:
      - name: ovs1
        description: separate bridge
        type: ovs-bridge
        state: up
        bridge:
          port:
            - name: ens4
    ovn:
      bridge-mappings:
        - localnet: default-network
          bridge: br-ex
        - localnet: tenantblue
          bridge: ovs1
```



Micro-segmentation



Physical network + micro-segmentation

- Policy manifest
- OVN northbound entities
- Demo - localnet topology + network policies

Roadmap

Next features

- IPAM for virt workloads
  - “Sticky” IPs for virt workloads
- Selector policies for virt workloads
  - Requires IPAM - OVN-Kubernetes must be aware of the IPs assigned to the workloads
- Services for secondary networks
  - Ingress
  - Egress
- Self-service networks
  - … create layer2 overlays without admin intervention

Lessons learnt

- Collaboration between different companies
  - Red Hat & NVIDIA
  - … for exactly the same use cases
  - … but with different scope in mind

- User experience
  - Physical network configuration was not originally in scope
    - NNCP & OVN bridge mappings API mitigated bad UX
  - Insert <JSON-in-yaml horror story> here
    - Vlan vs vlanID
    - The resource kind …
    - Different clients have different behaviors - oc vs kubectl

Thank you! Questions ?...